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Supporting social pretend play with a virtual toy

Khairunnisa Mispa¹, Evi Indriasari Mansor^{1,2}, Azrina Kamaruddin¹, Joanne Hinds³

¹Faculty of Computer Science &
Information Technology
Universiti Putra Malaysia
UPM Serdang, Malaysia

²College of Computer &
Information Sciences
Prince Sultan University
Riyadh, Saudi Arabia

³School of Management
University of Bath
Bath, United Kingdom

khai.mispa@gmail.com, {evi, azrina}@upm.edu.my, emansor@psu.edu.sa, J.Hinds@bath.ac.uk

ABSTRACT

This paper presents selected results from a study designed to explore children's social pretend play in a virtual setting. Fourteen children (aged 5 - 8) played in pairs with a mobile-based game implemented on an Apple iPad. Interviews and video transcriptions were used to assess three types of social pretend play, which included solitary, simple and associative. Our findings revealed the ways children engaged with the virtual toy and demonstrate social pretend play. We discuss the implications of these findings and provide a series of design implications for designers and researchers.

Author Keywords

Children; methodology; social pretend play; virtual toy.

ACM Classification Keywords

H.5. Information interfaces and presentation (e.g., HCI):
User Interfaces - Evaluation/Methodology; Prototyping.

INTRODUCTION

Children spend a large proportion of their lives playing, through which they are able to develop skills and explore imaginary worlds [2]. Play is recognized as a critical process in childhood when children develop their imagination and creativity [3]. By nature, children love to take part in role-play or act out scenarios such as pretending to be a teacher, doctor, mother, daughter, etc. They often use their creativity to give objects new meanings while playing, for example a pencil case can be used as a mobile phone, a book can become a computer, or a piece of paper can become a plate [15, 18, 20]. Traditionally, children played outdoors [2] where they were able to explore their surroundings, mix with society and play with various types of toys [10]. However, the rapid advancement of smart

phones and tablet computers in recent years led to the increasing demand of these devices among adults and children [5], at the same time changed the ways in which children play [2]. One downside is that without proper guidance and control, children may not use the technology in a way that is beneficial for them. For instance, a child may prefer to be isolated and play with the device alone rather than mixing with other people [11]. Our study seeks to address this issue and in doing so, we investigate a prototype game which encourages social interaction in a virtual environment. Further, we examine the children's abilities to include social elements while playing imaginatively with a mobile-based game prototype. By considering the need for social elements in children's development, we use the findings to provide guidelines for designers and researcher in designing applications for children.

RELATED LITERATURES

The next section reviews existing research, which helped guide the design of the study.

Social pretend play

Social play is an activity that occurs when two or more children interact with each other [4] and are: (a) motivated to engage with others in playful activities, (b) able to regulate emotional arousal, and (c) possessing the necessary skills to initiate interactions with other children [4]. Alternatively, social pretend play lies at the intersection of cognitive and social development where children manipulate the symbolic transformation in order to communicate with others [8]. The term "*pretend play*" includes imaginative, dramatic, make-believe, role or fantasy play, where children act out experiences they find interesting, invent scenarios and act within them as a form of play [10].

Previous studies have measured social pretend play in children's playing activities by performing (a) direct observation [8, 4], which involves the systematic recording of children's behaviors and (b) outside assessment [4] where reliable informants such as family, peers and teachers were interviewed and rated the children's social behaviors. In this study, we adapted these techniques by performing direct observations on children's playing activities and conducted

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both formal and informal interviews with people that had a close relationship with the children.

Virtual toy

A virtual world typically comprises a custom-built simulated world using two or three-dimensional graphical models, which a user plays and interact with [21]. The virtual world has become increasingly popular among children, who spend significant amounts of time online [14]. Indirectly, this may create a significant change in social practice, where children have the opportunity to construct their own identities and learn to engage with others online [14]. In the past, children's playing activity used to be highly social in nature and often occurred outdoors [17]. Nowadays, children tend to spend most of their time indoors, which often includes playing with technological devices [16]. These technological devices include a variety of electronic games, for example; a cooperative play in three-dimensional reality that allows children to develop their play, whether strategic or conceptual rule-based play [18].

There are many virtual toys that support children's play, yet few are deployed on mobile devices. Most of the existing virtual toys that enable imaginative play are based on a physical computer, which consumes space and can be restrictive to children's play. For example, *Tigrito* [12] - a high-affect computer-based virtual toy allows children to interact with emotive improvisational characters in three different ways; (a) directly, by treating the characters as autonomous toys, (b) via an avatar represented by a second character and (c) via a movie mode where two characters can interact and play with each other. Unfortunately, *Tigrito* does not support social interaction as children can only interact with a robot, thus there is no communications with living humans. Additionally, there is an interactive game known as *The Farm* [13] which operates on interactive tabletops. *The Farm* was developed to investigate children's imaginative play with virtual stimuli [13] and it allows children to create imaginative stories by dragging available objects around the screen and the selected objects then display their response. Besides, interacting with *The Farm* also allows the children to have social bonding as they may play together with their friends. However, the interactive tabletop is large in size and must be connected to a computer and a projector. Thus, it requires a specific space to be installed before enabling the children to play.

METHODOLOGY

This study aims to observe children's social pretend play when interacting with a virtual toy. The first author conducted the study at a local day care center located in a middle-class residential area. Permission from the day care center was obtained by issuing a permission letter and information sheet detailing the study. Before conducting the study, the researcher visited and spent some times at the day care center for three consecutive days to meet and mingle with the children in order to familiarize herself with

the children. These visits were to enable the children to feel comfortable with the researcher and to avoid them from feeling insecure with the presence of the researcher during the actual study. During the visits, the researcher also conducted random observations to identify the children's daily routine while they are in the day care center. These observations were performed to enable the researcher to plan an appropriate schedule to conduct the actual study without affecting the children's daily activities.

Questionnaire

As suggested by [4], an *outside assessment* was performed to collect information about the children in which the required information regarding the children was obtained from people who are close to them such as parents/guardians, teachers and friends. These people have the potential to observe the children in many different ways [4] and have been together with the children for a long period of time. Hence, the researcher believes that they are more familiar and have more information about the children besides to have their own views and opinions about the children. In this study, the researcher decided to perform an *outside assessment* among the children's parents/guardians because they believe that the parents/guardians have the longest experience of being with the children, meaning that know them very well.

The *outside assessment* can be performed by conducting a face-to-face or phone interview with the potential sources or distributing a survey or questionnaire to them. In performing the *outside assessment* in this study, questionnaires comprising a set of multiple choice and open-ended questions were distributed to parents/guardians and the questionnaires were divided into two sections; (a) the children's routine and (b) the children and technology. In the first section, the questions inquired about the children's daily routine and behavior, their favorite activities, which focused on playing activities, regular playing companion(s) and their social relationship with other people, including relatives and strangers. In the second section, we asked about their purpose and use of tablet computers as well as duration of usage per day. At the end of the questionnaire, we asked for parents/guardians' opinions and suggestions regarding the usage of technological devices among the children to support their play. These questions were raised in order to gauge the frequency of children's play and their social behavior with others as well as to ascertain the influences of current technology in their daily life. This information was used to help the researcher to design playing material that was tailored to their interests and behavior.

Participants

14 participants (9 girls and 4 boys) aged 5 to 8 years old volunteered to take part in the study. The researcher recruited the participants with the help from the day care center's management and the children's parents/guardians. All participants attended the day care center regularly and

were well acquainted prior to the study. Participants in this age range were recruited because at this age, they are beginning to improve their language abilities, are able to express different ideas and emotions and are starting to show a strong interest in making friends demonstrated through social bonding [19]. This prevalence enabled the researcher to assess their ability to apply social elements during the play session.

Settings

The study took place at the day care center as it was equally familiar to all participants. According to [1], a familiar environment makes children feel more comfortable and able to stay focused on an activity. To avoid any distractions from other children and the noisy atmosphere at the day care center, the management provided a private room to conduct and record the study peacefully.

The equipment used in this study included a tablet computer (Apple iPad), table, two stools and two video recorders with tripods. The Apple iPad was placed on the table in the middle of the room and the stools were placed next to each other beside the table. This arrangement was enabled the participants to sit side by side and play together by sharing the same Apple iPad. Two video recorders were used to record the activity; one was placed in front of the table to record participants' facial expressions and scripts delivered by the participants while playing, and the other was placed at the side of the table and focused on participants' hand gestures on the Apple iPad's screen so that during data analysis the researcher could see the objects that have been selected by participants (Figure 1). The researcher also used a digital camera to capture still images of the ongoing sessions for report writing purposes.



Figure 1. Arrangement of equipment used.

Materials

A mobile-based game prototype was used as a medium to support this study. The prototype was developed by the first author and was deployed in the Apple iPad. The game comprises an interface of an empty land (Figure 2).



Figure 2. Interface of an empty land.

Three groups of objects were provided; (a) buildings that consist of a school, hospital, bank, gas station, mosque, library, shopping mall, fire department, restaurant, police station and a house; (b) vehicles comprised a school bus, ambulance, lorry, bicycle, fire engine, car, taxi and a police car; (c) landscapes comprised a tree, fountain, bench, roundabout, seesaw, slide, swing, climbing frame and flower (Figure 3). Participants were required to choose the objects by pressing the "Add Item" button in order to fill the empty land. All of the objects emit sounds ("pling!") when selected and can be dragged around the screen. Further, the vehicles also produce distinctive sounds when touched, for example; the school bus made the sound of a honk ("pon! pon!"), and the ambulance made the sound of a siren ("neeeee!"). The vehicles can also move independently when dragged and positioned on the road. Further, participants were able to change the time mode to *day mode* or *night mode* based on their preferences in which the *day mode* will display the ambience during the day time with the appearance of a sun and the sound of singing birds, while the *night mode* displays the gloomy ambience at night with the presence of the moon, stars and sound of crickets.



Figure 3. Interface of the land after being filled with selected objects during the day time.

Procedures

Before the session began, participants were asked to choose a partner to encourage collaboration and communication during the play session. The rationale behind allowing the participants to choose their preferred partner was to ensure that the participants could play with ease and felt comfortable with their partner to aid them to perform well during the study. The participants included 3 mixed- gender pairs (2 pairs of siblings, 1 pair of friends) and 4 same- gender pairs (2 pairs of siblings, 2 pairs of friends). To ensure their anonymity, each participant was assigned an alphanumeric code; PM for boys and PF for girls followed by a number, for example; PM1 was assigned to the first boy. Each pair of participants was required to undergo two sessions; (a) a play session and (b) an interview session. We outline these sessions in further detail below.

Play session

At the beginning of the session, the researcher provided instructions regarding the game prototype and explained what they were required to do throughout the session. First, the researcher requested the participants to choose their representative character (Figure 4) by giving the following instruction: *"There are four characters available at the corner of the screen. Choose one of the characters to represent yourself."* The purpose of these characters is to support the imaginative stories presented by the participants during the play session. The presence of these characters will allow the participants to imagine themselves in their imaginative stories and make the stories more logical and interesting.

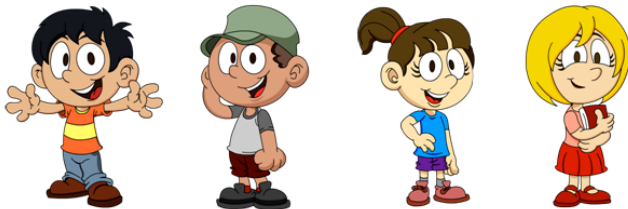


Figure 4. The selection of characters available.

After the participants had chosen their representative characters, the researcher issued the next instructions that requested the participants to play together by filling the empty land with the available objects and play imaginatively by creating their own stories using the objects. The instruction reads: *"Assume that you were given an empty land and you are free to build your own town. Together with your partner, add as many objects as you wish to your town by choosing them from the items' list and locate them wherever you like on the screen. Then, create your own stories or scenarios by using those objects."*

While they were diligently completing the task, their performance and actions were observed and recorded. Participants took around 15 to 20 minutes to complete the task and stopped when the researcher asked them to do so (Figure 5).



Figure 5. Participants play with the game prototype in pairs.

Interview session

For the interview, the researcher prepared a set of questions that were considered to be important and necessary for gathering additional information about the participants. The researcher devised an *interview schedule* [6] where the researcher read the questions to the participants and noted down their answers. This technique was chosen because the researcher believes that for this age range, most of the participants are still learning to read and write fluently. Therefore, the researcher assumed that it would be more time consuming if the participants answered the questionnaire on their own. In addition, the participants were also being interviewed in pairs in which the questions were read by the researcher and required responses from the participants simultaneously. The researcher decided to perform the interview sessions in pairs in order to save even more time and to avoid the participants from feeling bored while waiting for their turn to be interviewed if the interview sessions were made separately.

The sessions were also recorded in case the researcher missed any details in the participants' responses. The questions that were asked during the interview focused on their playing routine, playing materials (physical or virtual), companions and their opinions about playing with a company from a distance. Some of the questions were the same as those used in the parents/guardians' questionnaire, because the researcher wanted to collect responses from both adult and child perspectives.

Measures

To measure social pretend play, we adapted the idea from [8, 9] in which they evaluated the degree of pretense in social play. Three types of social pretend play were measured including:

- *Solitary pretend play*, which usually happens when participant A performs a fantasy action in social play while participant B ignores but still proceeds with the turn-taking structure. This might happen when participant A talks alone in the social play without receiving any response from participant B.

- *Simple social pretend play* happens when both participants engage in social play and perform fantasy actions. Their actions might depend on each other, for instance participant A follows participant B's action. Alternatively, participants might use the same object on the screen, but there is no effort in issuing dialogues or conversation while playing.
- *Associative social pretend play* occurs when participants engage in social play, where their interactions and scripts issued relate to the activity but not each others' roles. For example, participant A declares a role as a teacher, whilst participant B mentions that he/she wants to add more items.

Data analysis

Data analysis comprised two phases, which included: (a) questionnaire analysis and (b) video transcriptions of the play session analysis and interview session analysis. Questionnaires distributed to parents/guardians were analyzed and all important points raised were carefully considered. Meanwhile, all recorded videos from play and interview sessions were viewed and transcribed in order to establish whether the participants managed to include elements of social pretend play.

RESULTS

Questionnaire analysis

Out of the questionnaires that were distributed, only 7 sets were returned (response rates = 33.3%) and not all of these were from the participants' parents/guardians. Some of the returned questionnaires were from parents/guardians who did not allow their children to participate in the study. Nevertheless, the researcher believed that this data still provided useful information and decided to include the given information in the questionnaire analysis.

According to the parents/guardians' responses, most of the participants spent their free time playing in comparison to other activities such as watching television, reading, or engaging in outdoor activities. Children often play with companions, which include siblings, cousins, neighbors, and friends. They also reported having good social relationships with people around them.

Most of the parents/guardians mentioned that they allow their children to use tablets and most of them owned at least one tablet device at home. The use of tablets includes playing mobile game applications, watching videos from the internet (YouTube) and information searching for educational purposes. However, children's usage were under strict supervision from parents/guardians, where each application downloaded or accessed was monitored and limitations were enforced, such as two or three hours of usage, once or twice a week.

There was an overwhelming response from parents/guardians regarding the use of tablets, as they were

able to recognize the potential positive effects that interactive educational applications can have on learning. The variety of media implemented in the device exposed their children to the latest technology and helped them to develop their thinking skills. Although they supported the use of these devices, they also recognized that the uncontrolled continuous usage may be harmful for their children. Thus, they suggested there should always be limited in using these devices in order to maintain balance in their children's day-to-day life.

Video transcriptions

Play session analysis

As the period of completing the tasks were varied among all pairs; with the minimum of 15 minutes and maximum of 20 minutes, the researcher decided to limit the scoring up to 15 minutes only, with the intention to prevent any inequity and to avoid bias towards any scored variables. Social pretend play was scored in one-minute intervals. If any types of social pretend play occurred more than once in a minute, they were still counted once. The rationale for using the time-interval in scoring the variables is that, time-intervals are more appropriate for measuring variables with high frequencies and multiple behaviors, feelings or cognitions [7]. Since the frequency of the variables were quite high, the researcher chose to use the time-interval methods as the researcher found that this method is the best in scoring the variables during the analysis. The researcher sum up the scored variables to present the frequency of social pretend play involvement during the play session in Table 1:

	<i>n</i>	Frequency	Mean (SD)
Solitary pretend play	13	79	5.643 (4.012)
Simple social pretend play	14	90	6.429 (3.857)
Associative social pretend play	12	107	7.643 (5.706)
<i>*n = Number of participants (out of 14)</i>			

Table 1. The frequency of the involvement of social pretend play complexity.

Referring to Table 1, the *mean* was calculated as:

$Mean = (x_1 + x_2 + x_3 + \dots + x_N) / N$, where x is a frequency of social pretend play elements performed by each participant within the 15 minutes and N is a total number of participants that are 14 participants all together.

The results in Table 1 demonstrate that most of the participants managed to include social pretend play during the play session, especially *simple social pretend play* with $n = 14$ (mean = 6.429, SD = 3.857). This displays the participants' ability to engage with social pretend play

when playing with a virtual toy. An example of *simple social pretend play* is as follows:

[PM1 (boy, 6 years old) and PF3 (girl, 7 years, 6 months) are pairs of friends, playing together without delivering any dialogue]:

[02' 06"] PF3: (Added an object known as gas station, whilst PM1 was watching her action).

[02' 12"] PM1: (Drag his representative character to the new gas station added by PF3, whilst PF3 was watching his action).

[02' 16"] PF3: (Follows PM1's action by dragging her representative character to the new added gas station, whilst PM1 watches her action).

Instances of *solitary pretend play* were also performed by 13 participants (mean = 5.643, SD = 4.012) and from the observed video, the researcher noticed that most of the participants performed *solitary pretend play* at the beginning of the play session as they were preoccupied selecting their desired objects and ignored their partner. An example of *solitary pretend play* as follows:

[PF1 (girl, 6 years old) and PF2 (girl, 6 years, 9 months) are pairs of friends, at the beginning of the play session]:

[00' 32"] PF1: (PF1 was selecting her own representative character, whilst PF2 was looking at the researcher).

[00' 38"] PF1: *Put it a little bit further.* (When PF2 was selecting her representative character, PF1 requested PF2 to place her selected representative character a short distance from PF1's representative character but PF2 ignored PF1's order).

Associative social pretend play demonstrated the highest frequency (mean = 7.643, SD = 5.706), even though there were only 12 participants that displayed it during the play session. This happened when there were pairs who performed *associative social pretend play* more frequently during the session. An example of *associative social pretend play* as follows:

[PF6 (girl, 7 years, 8 months) and PF7 (girl, 5 years, 11 months) are pairs of siblings, playing together and in the process of adding more objects to their town]:

[16' 06"] PF7: *Do you want this bench?* (PF7 asked PF6 whether she wants to add an object known as a bench).

[16' 09"] PF6: *We already have that.* (PF6 informed PF7 that they already added the bench).

[16' 14"] PF7: *How about a tree? Or a mosque?* (PF7 asked PF6 whether she wants to add objects known as a tree or a mosque).

[16' 21"] PF6: *We already have that also (mosque).* (PF6 respond to PF7 by informing that they already have a mosque).

Interview session analysis

In the interview, most of the participants mentioned that they played almost every day, usually after school or during the evenings when they are at home. Both physical and virtual toys were used to support their play, yet some mentioned that they prefer to play with physical toys as they like to be able to touch them. Further, these types of toys can be used differently, in contrast to virtual toys with attractive interactive features. With regards to their playing companions, the majority of participants had their own playing partner – their relatives, neighbors or friends. They mentioned that they found playing with a companion to be more satisfying and fun as they were able to share different types of toys and undertake a variety of activities together. However, two participants explained that they regularly play alone because they did not have any other siblings and their parents were too busy to play with them. One of these participants also declared that he preferred to play alone because he does not like to share his belongings with other people.

We also asked for participants' opinions regarding playing with other people in different locations. Some participants did not like the idea as they felt it was impossible to play with their partner remotely. Others thought it was an amazing idea as they explained that sometimes they were not allowed to go out and play with their friends. Hence, incorporating a feature that allows children to play with their friends from different locations should make play more interesting than playing alone at home.

DISCUSSION

The methodology

Conducting study involving human beings in a specific age group requires the researcher to carefully plan and decide the appropriate methodology to be used. This is to ensure that the study is conducted to the highest possible standard and so that the obtained results are useful to the researcher. Throughout the study, several methods were performed, including the *outside assessment* [4] where, parents/guardians were distributed with a set of questionnaires regarding their children in order to get a better understanding about them. To provide the parents/guardians' with time and flexibility in answering the questions, the researcher allowed the parents/guardians to take home the questionnaires and return the questionnaires when they were ready within a week. Moreover, the questionnaires were created in a simple structured way so they were easy to understand and so that the parents/guardians could complete them quickly. Performing *outside assessment* [4] helped the researcher to obtain information regarding the children. Although there was a lack of responses from parents/guardians, the researcher fully utilized the data collected.

Additionally, selecting the group of participants is also critical as the child development and behavior can be varied. The chosen age group was made after the researcher

considered the children's language, creativity, ability to understand and follow instructions, their ability in expressing emotions as well as their social relationship. Performing a *direct observation* [8, 4] both before and during the study, allowed the researcher to observe the participants' attitude and natural behavior. From the random observations that were performed before the actual study, the researcher found that children aged 5 to 8 years old are the best group to be recruited for the study as they fulfill the requirements that the researcher looked for. Further, during the study, the participants were aware that they were being recorded, but none of them appeared to act differently in front of the camera, thus the researcher believes that the participants displayed their real behavior without hesitation. Recording the study was also very useful, as the researcher was able to review each session at any time if necessary.

Additionally, the interviews conducted with the participants allowed the researcher to get an overview of their playing requirements and preferences. Thus, the researcher was able to discover which aspects of playing are rarely satisfied, along with the participants' expectations when using tablet devices.

The study

From the feedback received, the researcher assumed that children build social relationship and bond through play, as they always had companions when playing and did not experience problems interacting and communicating with other people. This was also supported in the declaration provided by parents/guardians, which stated that their children have no problems interacting with other people and can easily make friends when they meet new people. Whilst there are advantages and disadvantages of using this type of technology; most of the parents/guardians held positive perspectives, viewing the technology as a mechanism for diversifying the way in which children spend their leisure time.

The researcher concludes that children will be more active and productive when playing with a partner they already feel comfortable with. This was evident when participants played with their best friends or siblings – they tended to create a variety of ideas and stories during the play session, whilst simultaneously including elements of social pretend play without realizing. Despite their young age, they had their own preferences and expectations regarding their playing activities and materials that were needed to support their play. By playing using the technology, the researcher found that children were able to play imaginatively without any problems as they were seen to creatively invent stories depending on the objects provided in the virtual toy. Thus, the researcher assumed that playing with virtual toy may also support children's imaginative play same as playing with physical toys.

Alternatively, the participants experienced a number of problems during the play session. These included; (a) some

of the participants experienced difficulty in clicking the objects due to their small size, making the selection difficult, (b) some technical errors occurred when some objects could not be dragged around the screen and (c) the limited number of objects available in the prototype limited the participants' story creation during the session.

IMPLICATIONS

The researcher encountered some problems in obtaining information regarding the children, where the number of returned questionnaires were low. Thus, a number of suggestions to improve the response rate in the future are summarized below:

- *Multiple-choice questions.* The researcher assumed that most of the unreturned questionnaires resulted from parents/guardians being too busy to answer the questions given. Thus, more multiple-choice questions rather than open-ended questions should be included in the questionnaire in order to reduce the time as well as to encourage the parents/guardians to answer the questionnaire completely and return it.
- *On the spot response.* The researcher also suggested that to refrain from allowing the parents/guardians to complete the questionnaire at home. This is because, allowing the parents/guardians to take home the questionnaires, increases the probability of not returning them.
- *Frequent follow-ups.* If the parents/guardians were allowed to answer the questionnaire at home, the researcher suggests undertaking more frequent follow-ups with parents/guardians. The follow-ups can be performed by phone calls, text messages or emails just to remind the parents/guardians to spend some time answering the questionnaire.

In terms of the designing the suitable play material for the children, the researcher has also identified a number of design implications that can be used as guidelines for designers and researchers. These are as follows:

- *Multiplayer play materials.* In order to ensure and encourage communication and positive social relationships among children, it is important to provide a conducive platform for them to do so. Playing materials that required multiple players may assist in fulfilling the requirement to communicate and socialize, where they can play together and interact with each other to strengthen the social relationships between them.
- *Appropriate objects' size.* Though children's fingers are mostly small in size, some children also have large-sized fingers. Therefore, it is important to create objects that are clickable or touchable by any finger size, in order to facilitate interaction with the device.

- *Diversifying selection of objects.* It is better to provide a wider choice of objects for the children to select. These objects should include those that the children are already familiar with. The rationale is to expand the options in supporting their play and enable them to vary their story while playing.

CONCLUSIONS

There were lots of lessons learned and experienced when performing the study. The selection of appropriate methods affected the information that was intended to obtain and influence the findings of the study. Thus, it is advisable to always plan the methods and techniques properly before undertaking any study to avoid any complications during the study.

The results show evidence of children's imaginative play with a virtual toy. By playing together using the shared tablet, children were able to play different roles and create different stories while playing together. Virtual toys installed in mobile devices are more portable and children can play with them 'on the go', which removes the cumbersome task carrying physical toys when travelling. All deficiencies identified during the study both in terms of the methodology and the procedure have been taken into account for improvements in the future.

Our next plan is to expand this prototype by adding features that allow children to communicate and play imaginatively with their friends remotely anytime and anywhere.

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